United States Department of the Interior
Fish and Wildlife Service

Fishery Leaflet 66

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PACIFIC OCEANIC FISHERY
INVESTIGATIONS

Chicago 54, Ill. * July 1944

PRESERVATION AND CARE OF FISH NETS

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Wartime dislocations have seriously decreased the supply of webbing available for fish nets. If fishermen are to continue maximum efficiency of operation, it is now imperative that they use every means available to extend the life of their nets.

Aside from normal losses, all fishing gear must eventually be replaced because of chafing, oxidation, and bacterial action. Continuing investigations by the Fish and Wildlife Service indicate that by properly treating nets, these causes of deterioration can be materially reduced. The suggestions in this article are intended to re-acquaint fishermen with some of the easier and more practical methods of preservation which are not unduly time-consuming.

The three general types of preservatives in common use are coal tar, copper containing compounds, and tanbark extracts which may be used singly or in combination. Coal tar, and to some extent pine tar, are used primarily for "heavy nets"----pounds, traps, otter-trawls; and seines--where abrasion is an important factor. "Light nets"--gill and trammel nets, and light seines--are of soft texture, and require a non-hardening preservative.

TAR TREATMENT

Application of coal tar offers a simple and effective means of preserving heavy nets. Fisheries specifications coal tar,1/ a vertical retort tar, sometimes called seine tar, is recommended for best results. This product may be obtained through most supply stores. If for any reason it is necessary or desirable to thin the tar, water-gas-tar oil with a viscosity of less than 2.00 at 40° C. (Engler) is recommended.

The tar should be heated in a water jacket or steam-coil heated tank. If the tarring must be done in direct-fired receptacles, such as iron kettles or cut-off oil barrels, the tar should be continuously stirred to prevent local

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1/Fisheries specification tar A (American Society for Testing Materials Specification R. T.), as recommended for use on fish nets by the United States Fish and Wildlife Service:

Water, not over 2 percent by volume.	Total distillation by weight to:
Specific gravity, minimum 1.10 at 25° C.	170° C. 5 percent maximum.
Specific viscosity at 40° C. 18 to 25.	270° C. 30 percent maximum.
Total bitumen, minimum 88 percent.	300° C. 40 percent maximum.

Softening point or residue 35° C. to 65° C.

overheating and charring of the webbing. The temperature of the tar should be between 150° F. and 180° F. This temperature range is adequate to give good penetration and will not burn or char the webbing. Common practice has been to test temperature by touch, but this is very unreliable.

Nets should be clean and thoroughly dry before the tar treatment is applied. The steam pipes should be checked for leaks; since any escaping steam will form a film of water on the surface of the tar, which will wet the net and cause inadequate penetration wherever this water absorption occurs.

Three-minute immersion should insure adequate penetration. Many fishermen consider it good practice to run the freshly-tarred netting through a wringer to remove the excess tar, then immerse the tarred net in fresh water for at least 12 hours to leach out water-soluble products considered harmful to netting. The netting should be hung in a shaded place with free air circulation, because direct sunlight in the drying process is harmful.

Various modifications of the coal-tar treatment for netting have been developed, and several good commercial products are available through fishery supply-houses. Experiments by the Fish and Wildlife Service indicate that a mixture of copper oleate or naphthenate, benzene, and coal tar, which can be readily prepared by fishermen, is an excellent treatment to reduce fouling. The proportions are $4\frac{1}{2}$ gallons of benzene and $5\frac{1}{2}$ gallons of coal tar for each 15 pounds of copper oleate or naphthenate. The copper compound should contain at least 6 to 8 percent copper, and be dissolved in the benzene before being added to the coal tar. A mixture of this type has the advantage of giving satisfactory penetration without heating and, because of its highly inflammable properties, should be kept away from flame.

Treatment with this mixture results in a lighter and more flexible net, and greatly reduced drying time. The preservative action will be improved if the nets are stored in the shade or under shelter, because sunlight causes the copper oleate or naphthenate to lose its effectiveness. Periodic application of the mixture is recommended.

Excellent results have been obtained in experiments with chrome-tanned netting subjected to a final tarring treatment.

COPPER TREATMENT

Copper treatments are generally indicated when a light, soft, pliable twine is desirable. Copper oleate and copper naphthenate are widely used for preserving light nets, but it is not a permanent preservative. Because it is slightly soluble in water, the compound gradually leaches out of the net; thus the treatment must be re-applied periodically.

The copper oleate or naphthenate should have a copper content of at least 6 or 8 percent and from 1 to 5 pounds of the paste may be used per gallon of kerosene depending upon the use of the gear. Superior penetration is obtained when the gear is immersed for several hours rather than the customary 5 to 15 minutes. Experiments indicate that the life of netting may be nearly doubled by a "refreshing" treatment, consisting of 1 or 2 pounds of copper compound per gallon of solvent applied every 30 days for salt water use and more often for fresh water.

Nets treated with copper compounds should be stored in a well-ventilated, shady place, as direct sunlight oxidizes the preservative and renders it crumbly and useless. In addition, the twine itself is weakened as a result of this oxidation.

Copper sulphate (bluestone) exercises a marked preserving action on linen thread and gives fair results with cotton. Nets and lines periodically treated with bluestone take on a blue color indicating that there is some fixing of the copper compound. Since it has remarkable slime and dirt removing properties, however, bluestone should be regarded as a cleaning agent rather than as a preservative.

A dip of common, copper bottom-paint has given excellent results on pound nets where barnacle and vegetable growths have proved irksome. As dried copper paint is quite brittle, any surface accumulation will disappear if the twine is subject to much bending. Copper paint has been quite successfully used as a preservative for lacing twine on seines, thus avoiding the undesirable characteristics of freshly-tarred twine.

Oxidation of textile fibers is accelerated in the presence of copper compounds, and deterioration results. Copper treatment, other than with bluestone, therefore, is not recommended within 15 days prior to the end of the season.

TANNING TREATMENTS

Treatment of netting with cutch or tanbark extracts is one of the oldest methods of preservation in use, and is still highly recommended where a light net is desired and color is not objectionable. Tanning is quite simple if the necessary tanks are available.

The treating solution is made by dissolving cutch extract in boiling water in the proportion of 6 pounds to 12 gallons. If cutch is not available, or tanbark is preferred, 13 pounds of oak or hemlock bark may be substituted in the same volume of water. It is recommended that the net be immersed in the near boiling solution for 12 hours. A direct-fired kettle may be used for this purpose, but a water-jacketed tank or one heated with steam coils is preferable. When direct-fired kettles are used, a grid is recommended to prevent the net from coming into contact with the bottom of the kettle. If no further treatment is contemplated, the netting should be thoroughly dried in a shady place until ready for use. The tanning solution may be stored for subsequent treatment, but some cutch and water should be added to bring it to original strength and volume before re-use.

The gear should be treated at regular intervals to give maximum life. The frequency of treatment depends upon the conditions of use and the amount of foreign material. A few fishermen give their nets a refreshing treatment after 6 days' use, but the average is probably nearer 25 days. It is recommended that successive treatments be applied before there is noticeable fading of color. If the net is exposed to severe slime conditions, common salt should be sprinkled throughout the net at the end of each day's operations and the net be retanned at least every two weeks.

To effect a superior tanning, the freshly-tanned and drained net may be given a subsequent chrome fixing-bath. This will increase the stability of the tannin, resulting in better preservation. The bath is made up by dissolving

4 ounces of potassium dichromate (redstone) in 12 gallons of boiling water. The net should be boiled for 15 minutes then immediately given a rinse in clear water. This solution need not be saved, as a fresh solution must be prepared for each refreshing treatment.

CLEANING OF NETS

There is no known preservative which will protect nets against damage from lack of cleanliness or careless storage. All gear freshly fished is more or less contaminated with fish slime and other matter which should be removed or neutralized as quickly as practical. The cleaning agents in most common use are brine, bluestone, and lime.

The immediate washing and drying of nets is often impractical in some fisheries and impossible in others, but a simple brine treatment is quite valuable. The nets may be dipped in strong brine or sprinkled with generous quantities of coarse common salt and sea water or brine poured over them. This method is generally used to preserve the purse-seine nets of the menhaden and mackerel fisheries.

Treatment of nets with bluestone solution is universally used and highly recommended by Pacific coast fishermen for prolonging the life of all types of fishing gear. As stated previously, this treatment has a pronounced cleaning action in addition to being a preservative. The strength of the solution depends upon the preference of the individual fisherman and his judgment as to the amount of slime and sediment on the gear. Generally, 25 to 40 pounds of bluestone (copper sulphate) is dissolved in about 200 gallons of water. Exact proportions are seldom used, the strength being determined by the color of the solution. The most common procedure is to place the bluestone in a burlap sack and work it through water in a suitable small boat or tank. Fifty or a hundred pounds of salt may also be added, but this is not considered necessary by most fishermen. The solution may be poured over the net or the net immersed in it, but there is evidence that better cleansing and preservation results by submerging the net. Large nets, such as seines, are dipped a portion at a time by letting them into and pulling them out of the boat (skiff) or tank. It is recommended that the net be washed or used within 36 hours after such dipping. The blue-stone treatment should be applied at least every two weeks and, if slime conditions are severe, the nets should be "salted" at the conclusion of each day's operation. Nets which receive these additional bluestone and salt treatments will last 3 to 4 seasons in the salmon, and 2 to 3 seasons in the herring and pilchard fisheries.

Lime water is used extensively by gill-netters in the Great Lakes, and to some extent by New England gill-net fishermen to clean their nets. Lime water is easily prepared by keeping a few inches of slacked lime in a barrel or tank, adding as much water as possible, and stirring thoroughly. After the milky color disappears, the clear solution is ready for use. Immediately after removing the fish, lime water is poured over the nets which are then rinsed with clear water. Two pails of lime water are adequate for a small gill net. Soaking nets for a day or two in clear, fresh water, just prior to storage, is a simple and very effective means of ridding them of any marine growths which may have become attached to the webbing.

STORAGE OF NETS

Improper storage of nets invariably results in considerable damage to gear and consequent loss to the owner. Nets washed immediately after use and dried in the shade keep their strength remarkably well. While exposure to sunlight for several hours acts as a strong deterrent to destructive bacteria, prolonged exposure is quite injurious. Tests also show that industrial gases containing sulphurous fumes may cause serious damage to wet linen, with cotton netting affected to a lesser extent. A wet net piled up under a tight cover may be quickly ruined by bacteria and mildew.

Nets should be stored loosely suspended in a well-ventilated shelter with free circulation of air. If it is necessary to heap the nets, liberal quantities of salt should be used between the layers of twine.

The necessity for longer life from fish nets cannot be over-emphasized.